

CONTENTS

Technical Manual

No. 5-697

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 6 December 2002

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

COMMISSIONING OF MECHANICAL SYSTEMS FOR COMMAND, CONTROL, COMMUNICATIONS, COMPUTER, INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (C4ISR) FACILITIES

CONTENTS

| | | <i>Paragraph</i> | <i>Page</i> |
|-----------|--|------------------|-------------|
| CHAPTER 1 | INTRODUCTION | | |
| | Purpose | 1-1 | 1-1 |
| | Scope | 1-2 | 1-1 |
| | References | 1-3 | 1-1 |
| | Objectives | 1-4 | 1-1 |
| | General system testing requirements | 1-5 | 1-1 |
| | Component testing | 1-6 | 1-2 |
| | System commissioning testing | 1-7 | 1-2 |
| | Cost of Commissioning | 1-8 | 1-3 |
| | Examples of commissioning | 1-9 | 1-3 |
| CHAPTER 2 | THE NEED FOR COMMISSIONING | | |
| | General background | 2-1 | 2-1 |
| | The importance of commissioning | 2-2 | 2-1 |
| | The economics of commissioning | 2-3 | 2-2 |
| CHAPTER 3 | THE COMMISSIONING PROCESS | | |
| | General | 3-1 | 3-1 |
| | Commissioning applicability to project phases | 3-2 | 3-2 |
| CHAPTER 4 | HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC) EQUIPMENT AND CONTROLS | | |
| | Description of HVAC systems | 4-1 | 4-1 |
| | Operation of HVAC systems | 4-2 | 4-2 |
| | General HVAC equipment description and operation | 4-3 | 4-4 |
| | Pre-functional test plan and functional performance test plan for HVAC systems | 4-4 | 4-10 |
| | Possible failures and corrective measures for HVAC systems | 4-5 | 4-11 |
| CHAPTER 5 | GENERATORS AND ANCILLARY EQUIPMENT | | |
| | Description of generator ancillary equipment, diesel fuel, and lube oil systems | 5-1 | 5-1 |
| | Operation of diesel fuel system and lube oil systems | 5-2 | 5-2 |
| | Pre-functional test plan and functional performance test plan for diesel fuel and lube oil systems | 5-3 | 5-3 |

TM 5-697
CONTENTS

| | | | |
|------------|---|-------------------------|--------------------|
| | Possible failures and corrective measures for diesel fuel and lube oil systems | <i>Paragraph</i> 5-4 | <i>Page</i> 5-4 |
| CHAPTER 6 | AIR COMPRESSORS AND PNEUMATIC CONTROL SYSTEMS | | |
| | Description of compressed air and pneumatic control systems | 6-1 | 6-1 |
| | Operation of compressed air systems | 6-2 | 6-2 |
| | General compressed air equipment description and operation | 6-3 | 6-2 |
| | Pre-functional test plan and functional performance test plan for compressed air systems | 6-4 | 6-4 |
| | Possible failures and corrective measures for compressed air systems | 6-5 | 6-5 |
| CHAPTER 7 | FIRE FIGHTING AND SUPPRESSION SYSTEMS | | |
| | Description of wet pipe sprinkler systems and fire detection systems | 7-1 | 7-1 |
| | Operation of wet pipe sprinkler systems and fire detection systems | 7-2 | 7-2 |
| | General fire fighting and suppression system equipment description and operation | 7-3 | 7-3 |
| | Pre-functional test plan and functional performance test plan for wet pipe sprinkler systems and fire detection systems | 7-4 | 7-4 |
| | Possible failures and corrective measures for wet pipe sprinkler system and fire detection system | 7-5 | 7-6 |
| CHAPTER 8 | LIFTING AND MOVING DEVICES SUCH AS CRANES AND ELEVATORS | | |
| | Description of lifting and moving devices | 8-1 | 8-1 |
| | Operation of lifting and moving devices | 8-2 | 8-1 |
| | Pre-functional test plan and functional performance test plan for lifting and moving devices | 8-3 | 8-3 |
| | Possible failures and corrective measures for lifting and moving devices | 8-4 | 8-6 |
| CHAPTER 9 | HIGH ALTITUDE ELECTROMAGNETIC PULSE (HEMP) EQUIPMENT AND CONTROLS | | |
| | Description of HEMP protection for mechanical systems | 9-1 | 9-1 |
| | Operation of HEMP protection for mechanical systems | 9-2 | 9-2 |
| | Pre-functional test plan and functional performance test plan for HEMP protection of mechanical systems | 9-3 | 9-2 |
| | Possible failures and corrective measures for HEMP protection of mechanical systems | 9-4 | 9-2 |
| CHAPTER 10 | WATER AND SEWAGE TREATMENT SYSTEMS | | |
| | Description of water and sewage treatment systems | 10-1 | 10-1 |
| | Operation of water and sewage treatment systems | 10-2 | 10-4 |
| | General water and sewage treatment equipment description and operation | 10-3 | 10-6 |
| | Pre-functional test plan and functional performance test plan for water and sewage treatment systems | 10-4 | 10-9 |
| | Possible failures and corrective measures for water and sewage treatment systems | 10-5 | 10-10 |
| APPENDIX A | REFERENCES | | A-1 |

CONTENTS

| | <i>Paragraph</i> | <i>Page</i> |
|----------|------------------|-------------|
| GLOSSARY | | G-1 |

List of Tables

| <i>Table</i> | <i>Title</i> | <i>Page</i> |
|--------------|--|-------------|
| Table 1-1 | Costs of construction, new construction | 1-3 |
| Table 4-1 | Possible failures and corrective actions of HVAC system | 4-15 |
| Table 5-1 | Possible failures and corrective actions for diesel fuel and lube oil systems | 5-7 |
| Table 6-1 | Possible failures and correction actions for compressed air system | 6-7 |
| Table 7-1 | Possible failures and correction actions for wet pipe sprinkler system and fire detection system | 7-6 |
| Table 8-1 | Possible failures and corrective actions for lifting and moving devices | 8-6 |
| Table 9-1 | Possible failures and corrective actions for HEMP protection of mechanical systems | 9-4 |
| Table 10-1 | Possible failures and corrective actions for water supply, water treatment, and sewage treatment systems | 10-13 |

List of Figures

| <i>Figure</i> | <i>Title</i> | <i>Page</i> |
|---------------|---|-------------|
| Figure 4-1 | Schematic of a typical HVAC system | 4-2 |
| Figure 4-2 | Typical HVAC control loop | 4-3 |
| Figure 4-3 | Example: DA Form 7477-R | 4-12 |
| Figure 4-4 | Example: DA Form 7478-R | 4-13 |
| Figure 4-5 | Example: DA Form 7479-R | 4-14 |
| Figure 5-1 | Schematic of a typical diesel fuel system | 5-1 |
| Figure 5-2 | Schematic of a typical lube oil system | 5-2 |
| Figure 5-3 | Example: DA Form 7480-R | 5-5 |
| Figure 5-4 | Example: DA Form 7481-R | 5-6 |
| Figure 6-1 | Schematic of a typical compressed air system | 6-1 |
| Figure 6-2 | Example: DA Form 7482-R | 6-6 |
| Figure 7-1 | Typical wet pipe sprinkler system | 7-1 |
| Figure 7-2 | Example: DA Form 7483-R | 7-5 |
| Figure 8-1 | Example: DA Form 7484-R | 8-4 |
| Figure 8-2 | Example: DA Form 7485-R | 8-5 |
| Figure 9-1 | Example: DA Form 7486-R | 9-3 |
| Figure 10-1 | Schematic of a typical potable and process water system | 10-1 |
| Figure 10-2 | Schematic of a process water treatment system | 10-2 |
| Figure 10-3 | A cross section of a septic tank | 10-3 |
| Figure 10-4 | Sewage trickling filter process | 10-3 |
| Figure 10-5 | Example: DA Form 7487-R | 10-11 |
| Figure 10-6 | Example: DA Form 7488-R | 10-12 |